(ii) removing water from the aqueous solution to leave a polysaccharide-containing coating on the surface having a thickness of at least 0.01 microns; and

(B) subsequently removing the polysaccharide-containing coating from surface using an aqueous solution;

wherein the at least one polysaccharide of step (A) and the aqueous solution of step (B) are chosen so that the surface has a contact angle after step (B) which is less than or equal to 8°.

A copy of original Claim 1 annotated to show the changes made by this amendment is attached as Exhibit A.

REMARKS

The present invention relates to the challenging problem of protecting glass sheets, such as those used in the manufacture of liquid crystal displays (LCDs), from: (1) contamination during handling, shipping, and storage; and (2) glass chip adhesion during cutting and/or edge grinding.

In the manufacture of liquid crystal displays, glass sheets serve as substrates upon which are formed thin film transistors (TFTs), which establish the "on" and "off" state of the pixels of the display. The TFT production process requires glass surfaces that are essentially completely free of both foreign substances and glass chips.

Significantly, foreign substances include both environmental contaminants and any residues from packaging material/protective films applied to the glass sheets after they have been manufactured. Accordingly,

it is not enough simply to apply a protective coating to the surface of the glass sheet, but the coating has to be one which can be removed prior to use of the sheet as a substrate in the TFT manufacturing process.

Applicants respectfully submit that it is in this area that the Examiner's primary references, i.e., Goodwillie et al., U.S. Patent No. 2,824,411 (Goodwillie et al.), and Lelah et al., "Wettability of Soda-Lime Glass: The Effect of Cleaning Procedures," Ceramic Bulletin, Vol. 58, No. 11, pp. 1121-1124, 1979 (Lelah et al.), are deficient. Indeed, as discussed below, rather than disclosing or suggesting the present invention, the Goodwillie et al./Lelah et al. combination actually teaches away from the invention. Likewise, the secondary references cited by the Examiner, i.e., Young et al., U.S. Patent No. 4,079,025, Fahey, U.S. Patent No. 4,397,913, Ohtake et al., U.S. Patent No. 4,878,973, and Mizosaki et al., U.S. Patent 5,998,766, do not lead to applicants' invention.

As set forth in Claim 1, what applicants discovered is that an aqueous solution of a polysaccharide can be applied to a glass surface which has a contact angle less than or equal to 8° (i.e., a surface that is substantially completely free of contamination) and then after the polysaccharide coating has performed its protective function, can be removed from the surface using another aqueous solution (e.g., a solution containing a detergent) so that after the removal, the surface again has a contact angle that is less than or equal to 8° (i.e., the surface is again substantially completely free of contamination).

Significantly, as shown in, for example, applicants' Table 5, not all polysaccharide/removal solution combinations will function in this manner. As set forth in this table, for a common set of application and removal conditions (see pages 17-19 of applicants' specification), the contact angle of the glass was found to return to below 8° for some polysaccharides, while for

others it did not. To emphasize this aspect of their invention, Claim 1 has been amended as set forth above to require that the polysaccharide(s) used in step (A) and the aqueous solution used in step (B) must be chosen so that after removal of the polysaccharide coating, the surface of the glass again has a contact angle which is less than or equal to 8°.

As the discussion to which we now turn shows, the references cited by the Examiner and, in particular, the Goodwillie et al. and Lelah et al. references, do not disclose or suggest such a polysaccharide/removal solution combination. Applicants further submit that a person skilled in the art would conclude from the Lelah et al. data, that Goodwillie et al. do not actually succeed in removing their coating, not that the present invention is anticipated or obvious.

Goodwillie et al. are concerned with the problem of "sweating out" of an alkaline surface film during, for example, annealing of soda-lime-silica glasses. As described by Goodwillie et al., such a surface film can result in "weathering" and "staining" of glass sheets during storage. (Goodwillie et al. at column 1, lines 25-49.)

Goodwillie et al. address this problem "by first buffing the sheet of glass to remove surface dirt and then coating both sides thereof with a skin-tight protective coating, preferably of a water-soluble carbohydrate or saccharid such as glucose or dextrin." (Goodwillie et al. at column 2, lines 8-13.) Other than stating that the water-soluble carbohydrate or saccharid can be glucose or dextrin, Goodwillie et al. do not give any specifics as to the materials which they actually used to coat their soda-lime glass. Indeed, from their use of the present and future tenses in their specification, it is not clear that Goodwillie et al. actually performed coating experiments. As to removal of the coating, all that Goodwillie et al. state is that "whenever it

is desired to remove it, this can be done by simply washing with clear water." (Goodwillie et al. at column 4, lines 40-41.)

Significantly, washing with clear water is one of the cleaning procedures which Lelah et al. tested. As reported in Table II of their article, such cleaning when applied to soda-lime glass resulted in a contact angle of 40°, not less than or equal to 8°, as required by applicants' claims. Indeed, even boiling detergent and detergent plus ultrasound only reduced the contact angle to 33° and 27°, respectively. (Lelah et al. at rows 2 and 3 of Table II.) Only a 60 minute treatment at 80°C of a chromic acid solution (100:5:8 of H_2SO_4:K_2CrO:H_2O) or 10 minutes at 95-100°C of a 1% tetrasodium EDTA solution produced contact angles of 8° or less. (Lelah et al. at rows 7 and 8 of Tables I and II.)

Moreover, Lelah et al.'s experiments were not performed on glass which had previously been coated in accordance with the Goodwillie et al. procedure. Rather, Lelah et al. performed their experiments on soda-lime microscope slides that "were first immersed in an ultrasonic bath containing distilled water at room temperature for ≈ 10 min." (Lelah et al. at page 1121.) Even with this pre-treatment, Lelah et al. report contact angles ranging from 16° to 40° in six out of eight cases, including, as discussed above, the clear water approach which Goodwillie et al. describe and which produced the largest contact angle of any of the cases.

Thus, rather than generating an expectation of success, applicants respectfully submit that a person skilled in the art would have an expectation of failure from the Goodwillie et al./Lelah et al. combination. In particular, a person skilled in the art would expect from the Lelah et al. data that Goodwillie et al. would not actually succeed in removing their coating "whenever it is desired to remove it ... by simply washing with clear

water." Rather, such a person would expect that Goodwillie et al. would have a contact angle of at least 40° after such a clear water washing.

An expectation of failure, of course, is not what will lead a skilled person to a new invention. Rather, it will lead away from the invention. Applicants respectfully submit that this is the case here and thus they believe that the Examiner's §102 and §103 rejections based on the Goodwillie et al./Lelah et al. combination should be withdrawn.

The remaining references cited by the Examiner do not bridge the gap between the Goodwillie et al./Lelah et al. combination and the present invention. Put simply, none of those references in any way recognizes the importance of choosing a combination of a polysaccharide and an aqueous removal solution so that a glass surface which initially has a contact angle $\leq 8°$ will again have such a contact angle after removal of the polysaccharide coating.

In addition to rejecting independent Claim 1, the Examiner also rejected applicants' dependent Claims 2-26 based on the Goodwillie et al./ Lelah et al. combination, either alone or, in some cases, in combination with one of the secondary references listed above. Applicants do not agree with these rejections. In particular, applicants do not agree with the Examiner's assertions regarding the disclosures of the references, his arguments regarding motivation to combine the references, or his interpretation of applicants' claims. However, in view of the fundamental differences between the present invention and the cited art discussed above, a detailed discussion of the additional distinctions provided by the dependent claims is not considered necessary at this point.

In view of the foregoing, applicants respectfully submit that the present application is now in condition for allowance. Accordingly,

reconsideration and the issuance of a notice of allowance for this application are respectfully requested.[1]

Respectfully submitted,

Date: 6/19/03

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[1] No extension of time is believed to be necessary for the filing of this Amendment, but if an extension of time is required, applicants request that this be considered a petition therefor. The Commissioner is hereby authorized to charge any fees which may be required for such an extension to Deposit Account No. 11-1158.

Exhibit A
Annotated Copy of Claim 1

1. (amended) A method for temporarily protecting glass from glass chips and/or scratching, said glass having at least one substantially flat surface, said method comprising:

(A) protecting the surface by:

(i) applying an aqueous solution comprising at least one polysaccharide to the surface, said surface having a contact angle less than or equal to 8° prior to the application of said aqueous solution; and

(ii) removing water from the aqueous solution to leave a polysaccharide-containing coating on the surface having a thickness of at least 0.01 microns; and

(B) subsequently removing the polysaccharide-containing coating from surface using an aqueous solution;

wherein the at least one polysaccharide of step (A) and the aqueous solution of step (B) are chosen so that the surface has a contact angle after step (B) which is less than or equal to 8°.